

Lake George Asian Clam Post-Treatment Survey

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The 2012 Fall mat treatment was initiated on 10-8-2012. The treatment lasted approximately 7 months over the late fall and winter months when the Asian clam is less active, as well as spring. Mats were removed in late Spring 2013. Despite apparent reduced clam activity during this time there were relatively few live clams found in the survey (141 total at all 7 sites) suggesting the treatment of Asian clams had induced mortality.

The surveys were conducted with SCUBA, snorkel and wading transects in a serpentine pattern across the mat treated zones. The survey included collecting sediment samples using 2mm sieves at each location. Each sample was collected on an approximate 10 foot by 10 foot grid. Sediments were sieved and examined in the field for the presence and abundance of live and dead Asian clams. Clams that were characterized in the field as being alive were brought back to the DFWI laboratory for final confirmation.

The surveys were completed using GPS points and flags delineating the mat treated zone. The scarcity of data transferred to the post-treatment survey team, including limited flagging at some locations, resulted in uncertainty in some surveys whether live Asian clams were inside or outside of the matted area. Therefore, the percent live clams found in "treated areas" may actually be less than reported because of these issues. Nevertheless, to maintain integrity in data dissemination the values reported are for the entire area surveyed. Hopefully, further integration of these post-treatment survey data with data from matting sub-contractors (by the Lake George Park Commission) will clarify.

Reporting for each of the locations includes:

1) Survey activity, 2) overall results, 3) observation, 4) days spent per site, 5) difficulties encountered.

Recommendations for future similar post-treatment survey efforts are included at the end of this report.

A summary table of findings from the Spring 2013 Post-Treatment Survey is provided below. The summary table reflects the treatment area table circulated by the Asian Clam Rapid Response Task Force for locations and size of treatment areas. This report breaks the Lake George village and Boon Bay sites into more specific areas for precise reporting purposes. The numbers reported include all survey sieve samples collected. In some instances the areas surveyed extended beyond the bounds of the "reported" matted treatment area. This was necessitated by uncertainties in the exact delineation of the treated areas.

NOTE: With more accurate delineations of the matted areas it is possible/likely that these results would indicate greater mortality rate associated with over-winter benthic barrier treatment.

Place	Mats	Reported GIS acres	Sieve Samples Needed	Total Samples Collected	Percent Complete	# Live Clams	# Dead Clams	Percent Alive	Samples with Live Clams	Live sample Percentage
Boon Bay	158	1.06	462	640	139%	25	1113.5	2%	13	2%
Diamond Cove	49	0.29	126	155	123%	0	8	0%	0	0%
Lake Forest	134	1.04	453	602	133%	7	563.5	1%	6	1%
Lake George Village	231	2	871	1205	138%	64	247	26%	40	3%
Middleworth Bay	108	0.67	292	440	151%	25	519.5	5%	20	5%
Paulist Fathers	40	0.24	105	133	127%	0	4	0%	0	0%
Shelving Rock	287	1.43	623	892	143%	20	147.5	14%	11	1%
Total	1007	6.73	2932	4067	139%	141	2603	5%	90	2%

Lake George Village South



Total Acreage sampled- 2.33

Total sieve samples- 696

Sieve samples with live clams- 15





Percent of Samples with live Asian Clams- 2%

Number of Live Asian Clams- 21

Number of Dead Asian Clams-146

Percent Alive-13%

Acreage requiring retreatment- 0.20

-  **Provided Boundary**
-  **Live Clams**
-  **Dead Clams**
-  **No Clams**

This site was surveyed on May 13, 16, 17, 31 and June 6, 2013 using SCUBA and snorkeling. Live clams were limited to two areas, one just east of the old courthouse and another more extensive area primarily along the sloping sandy area at the south end of Shepard Park just east of the restrooms and municipal building. **NOTE:** Mats and rebar are still present on the Lake Bottom on the eastern edge of this survey area.

Lake George Village North



Total Acreage sampled- 1.28

Total sieve samples- 509

Sieve Samples with live clams- 25





Percent of Samples with live Asian Clams- 5%

Number of Live Asian Clams- 43

Number of Dead Asian Clams-101

Percent Alive-30%

Acreage requiring retreatment- 0.21

-  **Provided Boundary**
-  **Live Clams**
-  **Dead Clams**
-  **No Clams**

This site was surveyed on May 15 and 17, 2013 using snorkeling and wading. Eighteen sieve samples containing 32 of the 43 live clams collected at this site were found well outside of the boundary area. This survey extended into untreated areas because of the paucity of flagging provided to delineate the treated zone. The treatment status for the remaining 7 sieve samples that contained live clams was unclear because the GPS boundary area provided was not as precise as needed. Live clams were clearly concentrated along the southern border of the area defined in the RFQ and independent sampling in this area continuing to Lake Avenue indicates that an extensive population of Asian clams resides in the sandy sediments between the English Brook delta and Lake Avenue. This area receives significant amounts of sheet flow and probably shallow groundwater inputs. Barrier matting could be successful here as a result of the homogeneity of substrates and few interfering structures.

Paulist Fathers



Total Acreage sampled- 0.24

Total sieve samples- 133

Sieve Samples with live clams- 0





Percent of Samples with live Asian Clams- 0%

Number of Live Asian Clams- 0

Number of Dead Asian Clams-4

Percent Alive-0%

Acreage requiring retreatment- 0

-  Provided Boundary
-  Live Clams
-  Dead Clams
-  No Clams

This site was surveyed on May 16, and June 13, 2013 using SCUBA and snorkeling. Live Asian clams were **not found** inside the treated area. It was unclear if the submerged crib dock was treated. Due to large boulders in the area, no sediment samples could be collected, however visual inspection was undertaken and no live clams were found.

Diamond Cove



Total Acreage sampled- 0.55

Total sieve samples- 155

Sieve Samples with live clams- 0





Percent of Samples with live Asian Clams- 0%

Number of Live Asian Clams- 0

Number of Dead Asian Clams-8

Percent Alive-0%

Acreage requiring retreatment- 0

-  **Provided Boundary**
-  **Live Clams**
-  **Dead Clams**
-  **No Clams**

This site was surveyed on May 14, 2013 using SCUBA and snorkeling. No live clams were found, however thousands of empty clam shells were winnowed parallel to and alongside and near bulkheads.

Middleworth Bay



Total Acreage sampled- 0.94

Total sieve samples- 440

Sieve Samples with live clams- 20





Percent of Samples with live Asian Clams- 4%

Number of Live Asian Clams- 25

Number of Dead Asian Clams-519.5

Percent Alive-5%

Acreage requiring retreatment- 0.25

-  Provided Boundary
-  Live Clams
-  Dead Clams
-  No Clams

This site was surveyed on May 30 and June 3, 2013 using a combination of snorkeling and SCUBA transects. Live clams were found throughout the treated area. Along the northern edge of the survey it is not clear whether samples were within the treated area or not. This questioned area accounts for 14 of the 20 sieve samples which contained 19 of the 25 live clams found. There is a clear indication that the area northwest of the survey area contains a significant population of Asian clams. Southwest of the survey area is complex and varied in depth and substrate, making control strategies here a challenge. As in other areas, thousands of empty clam shells had winnowed parallel to and along and near the vertical bulkhead to the west of Beckley's beach. **NOTE:** A considerable amount of rebar remains in the silty area near the southern perimeter of this area.

Boon Bay West



Total Acreage sampled- 0.96

Total sieve samples- 278

Sieve Samples with live clams- 12





Percent of Samples with live Asian Clams- 4%

Number of Live Asian Clams- 23

Number of Dead Asian Clams-711

Percent Alive-3%

Acreage requiring retreatment- 0.12

-  Provided Boundary
-  Live Clams
-  Dead Clams
-  No Clams

This site was surveyed on June 4 and 5, 2013. This survey was accomplished by snorkel adjacent to the shoreline and with SCUBA in greater than 25-30 feet of water. The survey in the treated zones identified many live clams in the near shore environment, suggesting widely distributed **incomplete success of matting** in this area. Exposure to wakes and wind waves from the southeast and extensive rock and rip-rap along the edge of the bay make this area difficult to mat. As in other areas, thousands of empty shells were winnowed parallel to and alongside and near vertical bulkheads. **NOTE:** Mats and rebar remain in silty areas greater than 25 feet deep at this site.

Boon Bay North



Total Acreage sampled- 0.59

Total sieve samples- 218

Sieve Samples with live clams- 0





Percent of Samples with live Asian Clams- 0%

Number of Live Asian Clams- 0

Number of Dead Asian Clams-199

Percent Alive-0%

Acreage requiring retreatment- 0

-  **Provided Boundary**
-  **Live Clams**
-  **Dead Clams**
-  **No Clams**

This site was surveyed on May 14, 2013 using SCUBA and snorkeling. No live Asian clams were found in this survey. The boundaries of the treated area were adequately delineated with pin flags. Over-winter benthic mat treatment was a successful strategy for this area.

Boon Bay East



Total Acreage sampled- 0.49

Total sieve samples- 144

Sieve Samples with live clams- 1





Percent of Samples with live Asian Clams- 1%

Number of Live Asian Clams- 2

Number of Dead Asian Clams-203.5

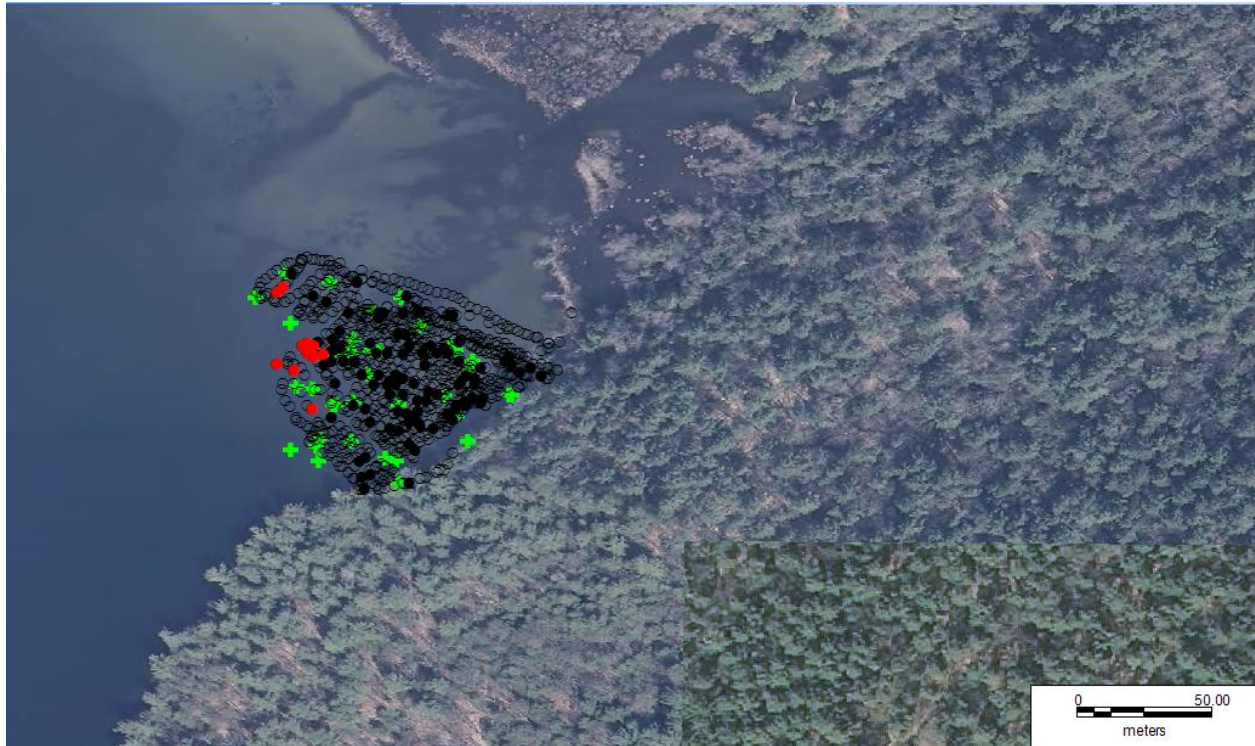
Percent Alive- 1%

Acreage requiring retreatment- 0.02

-  **Provided Boundary**
-  **Live Clams**
-  **Dead Clams**
-  **No Clams**

This site was surveyed on May 15, and June 13, 2013 using SCUBA and snorkeling. Only a single live Asian clam was found in the survey, adjacent to a dock with a vertical bulkhead where the treatment may have been less effective as a result of waves reflecting off the bulkhead and moving oxygenated water under the edge of the mat. As in other areas, many empty shells were winnowed parallel to and alongside and near vertical bulkheads.

Shelving Rock



Total Acreage sampled- 2.05

Total sieve samples- 892

Sieve Samples with live clams- 11





Percent of Samples with live Asian Clams- 1%

Number of Live Asian Clams- 20

Number of Dead Asian Clams-147.5

Percent Alive- 14%

Acreage requiring retreatment- 0.13

-  **Provided Boundary**
-  **Live Clams**
-  **Dead Clams**
-  **No Clams**

This site was surveyed on June 3, 12 and 13, 2013 using snorkeling and wading. Eleven sieve samples contained live Asian clams, however due to the paucity of pin flags and somewhat unclear GPS boundary points the number of these samples that were outside the treated area is unclear. The area to the west of the survey area likely has more locations of live Asian clams, therefore we recommend that prior to any additional treatment a larger scale in- depth survey is conducted.

Lake Forest [Home Owner Association]



Total Acreage sampled- 1.46

Total sieve samples- 602

Sieve Samples with live clams- 6





Percent of Samples with live Asian Clams- 1%

Number of Live Asian Clams- 7

Number of Dead Asian Clams- 563.5

Percent Alive- 1%

Acreage requiring retreatment- 0.09

-  **Provided Boundary**
-  **Live Clams**
-  **Dead Clams**
-  **No Clams**

This site was sampled on May 29 and June 6, 2013 using snorkel and SCUBA techniques. Five sieve samples containing live clams were collected along the edge of the "treated" area. Unfortunately, without more precise delineation of the "treated" area, it is unclear whether these clams were just inside or outside of the matted area. Only one Asian clam was found in the area that was clearly matted. This site includes many small docks that could interfere with effective benthic barrier matting. As seen at other sites, many empty shells were winnowed parallel to and alongside and near vertical bulkheads.

Recommendations:

Survey needs:

- Need for more detailed maps.
- Need for better flagging and GPS data distinguishing mat treated areas from adjacent non-treated areas.
- Need for accurate depth of each location for planning purposes.

Research:

- A study of the chemistry from water and sediments entrained under mats to better understand mortality induced by elevated ammonia and/or depressed oxygen.
- A study of naturally occurring winter clam mortality. This would make it possible to differentiate natural clam mortality versus mat-induced mortality during winter treatments.
- A study of the possible Asian clam migration from under mats in treated areas to adjacent non-matted areas. Given the frequent presence of live clams on the periphery of the treatment areas it is critical to determine if a larger "buffer zone" for matting is needed.

Alternate treatments:

As with previous surveys this survey has documented areas where benthic barrier matting probably will not work as the only treatment. Alternative treatments could include:

- "Surgical" suction harvesting
- Localized de-watering inside coffer dams or similar structures
- Heat-treatment
- Combinations of treatments based on site characteristics
- Others??

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Appendix

The following is a series of maps depicting a 5 meter buffer around each location with a positive identification of live Asian clams. The area that this space includes is provided as the area that requires additional treatment. This area is a minimum amount of space that will require additional treatment, however additional surveys may be required to identify areas needing treatment that are outside of the surveyed area.



Lake George Village (south)
5 meter buffer around all live points
~ 0.20 acres need retreatment



Lake George Village (north)
5 meter buffer around all live points
~ 0.21 acres need retreatment



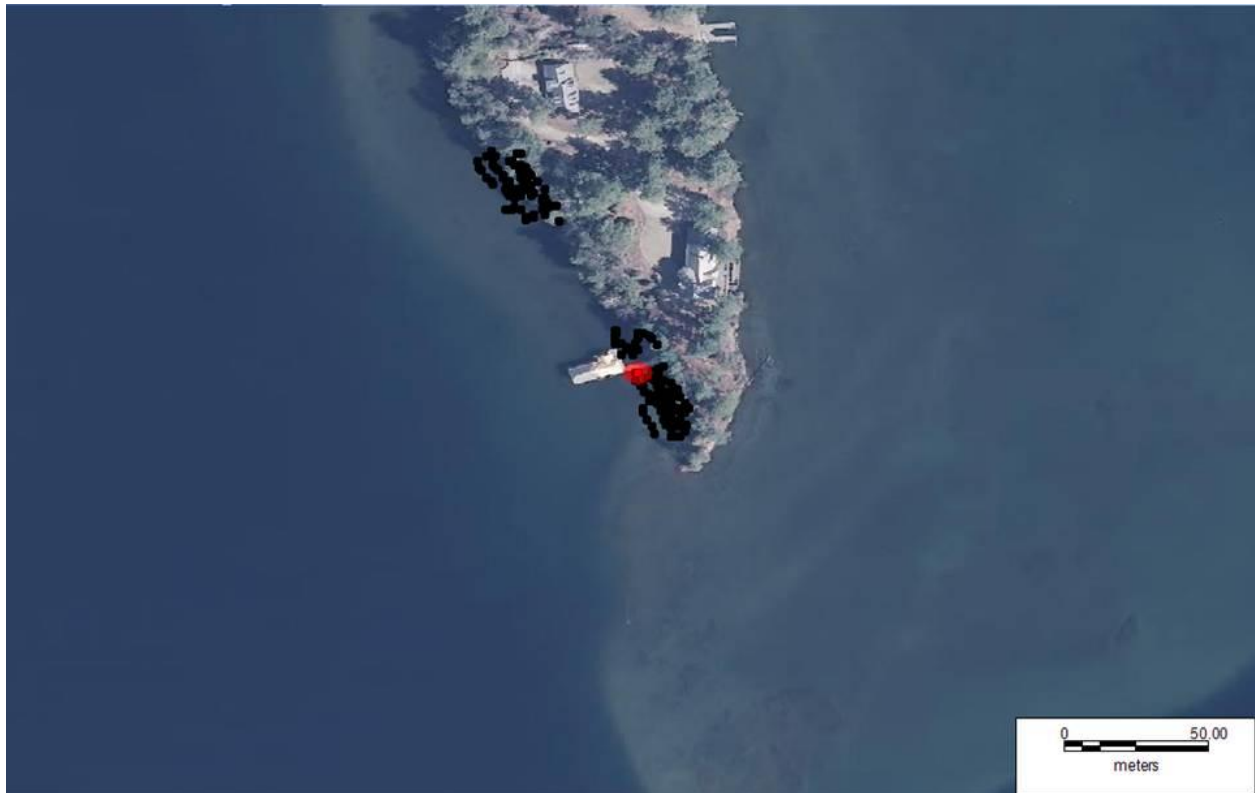
Middle Worth Bay
5 meter buffer around all live points
~ 0.25 acres need retreatment



Boon Bay (west)

5 meter buffer around all live points

~0.12 acres need retreatment



Boon Bay (east)
5 meter buffer around all live points
~ 0.02 acres need retreatment



Shelving Rock

5 meter buffer around all live points

~0.13 acres need retreatment



Lake Forest (Home owners association)
5 meter buffer around all live points
~ 0.09 acres need retreatment